



SMAPVEX19-22 Massachusetts Airborne Lidar, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Colliander, A., Xu, X., & Yueh, S. 2023. SMAPVEX19-22 Massachusetts Airborne Lidar, Version 1. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/Q06P5TZ8CBU5>. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/SV19MA_LID



National Snow and Ice Data Center

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1 DATA DESCRIPTION

These lidar measurements were collected in April and August 2022 in the vicinity of Petersham, MA during the SMAPVEX19-22 campaign. This location was chosen due to its forested land cover, as SMAPVEX19-22 aims to validate satellite derived soil moisture estimates in forested areas. The two acquisition periods were selected to characterize differences during "leaf-off" and "leaf-on" conditions.

1.1 Parameters

This dataset contains lidar point cloud data. Parameters included are X, Y, Z, intensity, and classification. A full listing of parameters can be found in Table A - 1. The vertical units (Z) of the data set are meters relative to the North American Vertical Datum of 1988 (NAVD88).

1.2 File Information

1.2.1 Format

Point cloud data are provided in LAZ format (.laz), a compressed version of the LAS (.las) lidar data format, using Point Data Record Format 6.

1.2.2 Naming Convention

Data files are named according to the following convention:

sv19ma_lid_[tile ID]_[yyyymm].laz

Table 1 describes the variables within each file name:

Table 1. File Naming Convention

Variable	Description
sv19ma	SMAPVEX19-22 campaign, Petersham, Massachusetts study domain
lid	LIDAR data
tile ID	Six-digit ID of the approximately 1000 m x 1000 m tile
yyyymm	Four-digit year and two-digit month of data acquisition
.laz	File extension

1.3 Spatial Information

1.3.1 Coverage

The Petersham, MA site is defined by the following geographic coordinates:

Northernmost Latitude: 42.72° N

Southernmost Latitude: 42.32° N

Easternmost Longitude: 71.91° W

Westernmost Longitude: 72.33° W

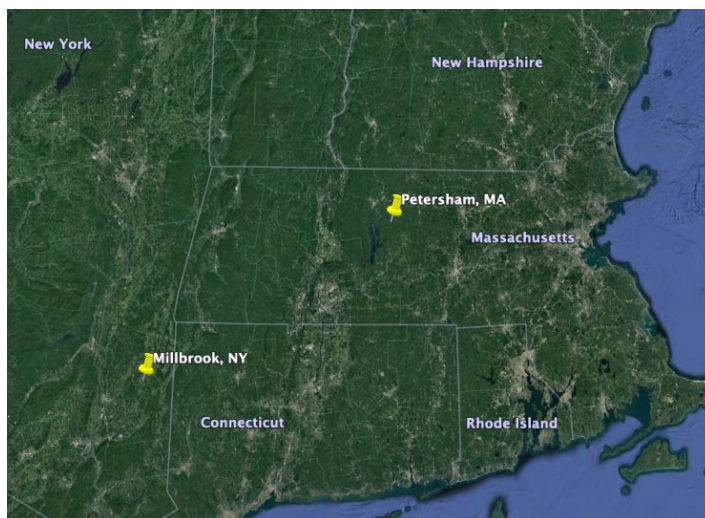


Figure 1. SMAPVEX19-22 Campaign Sites

1.3.2 Resolution

The data were acquired with a point density of 8 points per square meter.

1.3.3 Geolocation

These data are referenced to WGS84 horizontally and the NAVD88 (Geoid 18b) vertical datum.

The following table provides additional details on geolocating this data set.

Table 2. Geolocation Details

Geographic coordinate system	World Geodetic System 1984
Projected coordinate system	WGS84
Longitude of true origin	Prime Meridian, Greenwich
Latitude of true origin	N/A
Scale factor at longitude of true origin	N/A

Datum	WGS84
Ellipsoid/spheroid	WGS84
Units	degree
EPSG code	4326
PROJ4 string	+proj=longlat +datum=WGS84 +no_defs
Reference	http://epsg.io/4326

1.4 Temporal Information

1.4.1 Coverage and Resolution

The data set includes two sets of data representing data acquisitions from 4-5 April 2022 (leaf-off conditions) and 3-5 August 2022 (leaf-on conditions), respectively.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

Lidar scanning was conducted by Woolpert, under contract from NASA, using the Leica CityMapper-2 lidar mapping sensor. Approximately 40 scans were conducted in April and 40 in August.

2.2 Processing

Woolpert performed the lidar point cloud data processing including calibration, cleaning, classification, and final formatting of the LAZ file. There were seven classes in the LAZ lidar point cloud classification scheme (Table 3). These ground classified points from the LAZ file were used to derive DEM data (see [SMAPVEX19-22 Massachusetts Lidar Derived Digital Elevation Model](#)).

Table 3.

Value	Meaning
1	Unclassified
2	Ground
3	Low vegetation
4	Medium vegetation
5	High vegetation
6	Building
7	Noise

2.3 Quality, Errors, and Limitations

The vertical accuracy of the derived DEM is assumed to meet the below conditions. However, no quantitative assessment was performed.

- The RMSE_z for non-vegetated ground is ≤ 20 cm.
- Approximately 67% of all measurements are within 20 cm and 95% within 39.2 cm on hard unobstructed surfaces.
- Approximately 95% (with 5% unrestricted outliers) of all measurements are within 58.8 cm in vegetated land cover categories combined (includes tall grass, brush, and forested areas; does not include swamps or wetlands).

2.4 Instrumentation

Surveys were conducted using a Leica CityMapper-2 mapping sensor. For more information about this instrument, please see the [Leica Geosystems website](#).

3 RELATED DATA SETS

[SMAPVEX19-22 Massachusetts Lidar Derived Digital Elevation Model](#)

[SMAPVEX19-22 Millbrook Lidar Derived Digital Elevation Model](#)

[SMAPVEX19-22 Massachusetts Lidar Derived Digital Surface Model](#)

[SMAPVEX19-22 Millbrook Lidar Derived Digital Surface Model](#)

[SMAPVEX19-22 Massachusetts Temporary Soil Moisture Network](#)

[SMAPVEX19-22 Millbrook Temporary Soil Moisture Network](#)

[SMAPVEX19-21 Massachusetts Vegetation Optical Depth](#)

4 RELATED WEBSITES

[SMAP Validation Data](#)

[SMAP Overview](#)

5 DOCUMENT INFORMATION

5.1 Publication Date

August 2023

5.2 Date Last Updated

August 2023

APPENDIX A - LAS POINT CLOUD DATA RECORD PARAMETERS

The following table describes the parameters included in LAS Point Data Record Format 6 data. Refer to the [LAS Specification](#) document for additional information on these parameters.

Table A - 2: LAS Version 1.4 Point Cloud Data Record Parameters (LAS Format 6)

Item	Required
X	yes
Y	yes
Z	yes
Intensity	no
Return Number	yes
Number of Returns (Given Pulse)	yes
Classification Flags	no
Scanner Channel	yes
Scan Direction Flag	yes
Edge of Flight Line	yes
Classification	yes
User Data	no
Scan Angle	yes
Point Source ID	yes
GPS Time	yes